ORSA HANDBOOK
FOR THE
SENIOR COMMANDER

March 2008

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Center for Army Analysis
Fort Belvoir, Virginia

ORSA HANDBOOK FOR THE SENIOR COMMANDER

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PREFACE

The purpose of this handbook is to provide essential information about expectations that a Commander may have regarding Operations Research/Systems Analyst (ORSA) personnel in the operational environment. This handbook is intended as a quick-reference for military Commanders at Brigade-level and above to employ the unique skill sets that ORSA personnel possess.

The proponent of this publication is the FA49 Proponency Office. Submit changes and feedback for improving this publication to:

Director
Center for Army Analysis
ATTN: OCA Division
Fort Belvoir, Virginia 22060-5230
Phone: (703) 806-5507 (DSN: 656)

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

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INTRODUCTION

1. Purpose of Handbook.

a. Intended Audience. This handbook is intended for Commanders in an operational environment who have ORSA personnel on their staffs.

b. Reference Guide. This handbook is intended to be a quick-reference guide for forward-deployed Commanders on how best to utilize ORSA analytic capabilities.

c. Highlights Military Decision-Making Process (MDMP) and the assessment process. A major portion of the handbook reviews ORSA contributions to planning and assessments, with examples of various analyses ORSA personnel conduct in an operational environment.

2. Motivation for Using Handbook.

a. General. The Army is instituting new changes to the structure of Brigade-and-above staffs. This includes more ORSA positions in the Brigade, Division, Corps and Army Service Component Command (ASCC) staffs to assist the Commander and other staff elements in decision-making. This handbook helps Commanders to derive maximal benefit from the skills ORSA personnel offer in the operational environment.

b. From the Field. This handbook provides the lessons learned and best practices of analysts and Commanders in the operational environment at all levels of command. It applies the insights gleaned from the experience of ORSA personnel deployed in previous years to Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF). Feedback from operational and strategic Commanders who employed ORSA personnel on their staff also contributed to the content and structure of this handbook.

CHAPTER I: OPERATIONS RESEARCH ANALYST

1. Operations Research/Systems Analyst (ORSA).

This chapter is designed to provide an overview of ORSA capabilities. Specifically, it covers: *Who* ORSA personnel are; *What* they bring to the warfight; *Where* these skills may be applied in the operational environment; and *Why* ORSA personnel can help you.

2. Who are Operations Research/Systems Analysts?

The Operations Research/System Analyst (ORSA), Functional Area 49 (FA49) for military, Career Program Series 1515 for Army Civilians, is a science professional who produces analytic products (e.g. decision aids, models) to underpin decisions by Commanders and to enable solutions of varied and complex strategic, operational, tactical and managerial issues (DA PAM 600-3).

3. What do ORSA personnel bring to the warfight?

a. ORSA personnel use quantitative and qualitative analysis throughout the decision-making process. ORSA personnel are adept at problem solving, identifying risk, and communicating results and recommendations. ORSA techniques help to allocate scarce resources, and to prepare, plan, analyze, and assess operations (DA PAM 600-3). Figure 1.1 lists methods or tools ORSA personnel commonly use:

Figure 1.1 ORSA Methods and Tools.

• Data analysis	• Nodal or flow modeling
• Campaign assessments	• Interview techniques
• Risk mitigation	• Qualitative assessments
• Decision models	• Cost/benefit analysis
• Wargaming	• Probability assessment
• Simulation	• Trending and forecasting
• Resource allocation	• Geospatial analysis
• Survey design and analysis	• Effects assessment
• Data / info management	• Logistic support analysis

b. Operational Environment. In an operational environment, where decisions are made quickly and plans executed rapidly, the ORSA adds value in the following ways:

(1) Manage, analyze, and display large quantities of disparate data.

(2) Bring an analytical mind to bear in strategy and courses of action (COA) development and in wargaming.

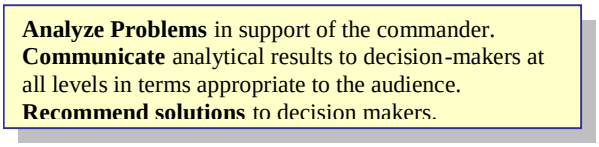
(3) Develop metrics for a wide array of topics, including campaign assessments.

(4) Provide recommendations that are tactically, operationally, and strategically relevant.

(5) Effectively communicate implications and recommendations to senior leaders and decision-makers.

(6) Improve overall staff abilities/effectiveness by sharing analytical and technical skills.

Figure 1.2 General ORSA Framework.



c. Examples in the Operational Environment. The following are specific examples of ORSA contributions in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).

(1) Analyzing significant event data to identify enemy and/or friendly spatial and temporal trends. ORSA personnel provided trend analysis in weekly, monthly and quarterly battle update assessments (BUAs) to the Commanders of Corps and echelons above Corps in both OIF and OEF.

(2) Developing strategies to allocate or employ Intelligence, Surveillance, and Reconnaissance (ISR) assets or other resources efficiently and fairly while minimizing risk. This included numerous counter-improvised explosive device (CIED) systems and counter-mortar systems.

(3) Improving supply chain and logistics operations to include developing or assessing loading, transportation, and distribution plans. Recent examples include assessing rates and modes of resupply for OEF and helicopter ring-route efficiency in OIF.

(4) Quantifying qualitative measures such as populace perceptions of democracy, governance, security, etc. ORSA personnel played a large role in many of the original survey designs and continue to analyze survey routes in both OIF and OEF

(5) Highlighting factors critical to assessing and managing risk, reducing risk and anticipating second and third-order effects. This is often in the form of trade-off matrices and decision-making tools.

(6) Determining the relative effectiveness of COAs, such as counter-threat techniques. ORSA personnel conducted numerous studies that capture the effect of CIED efforts or reduce the negative impacts (i.e. civilian casualties) of escalation of force practices.

4. Where are these skills applied in the Operational Environment?

a. ORSA skills can be applied at every stage of the MDMP from the Intelligence Preparation of the Battlefield (IPB) to the final assessment of the operation. Chapters 2 and 3 cover the role of ORSA personnel in the MDMP and assessment processes thoroughly. Figure 1.3 gives examples of contributions ORSAs can make within each staff element.

Figure 1.3 ORSA Support to Staff Sections.

Office of the Chief of Staff: Apply technical analytic skills and synchronize analytic efforts across staff elements in support of the Commander
Personnel: Support optimal personnel allocation during base realignments
Intelligence: Support intelligence products with quantitative and qualitative analysis and risk estimates
Ops and Training: Support mission planning, conduct risk assessment and campaign assessment
Logistics: Schedule supply convoys to increase efficiency and reduce vehicles or on-road exposure time in delivering daily supplies to a forward based battalion
Civil-Military Ops: Develop and analyze surveys
C4 Ops: Manage data and information
Info Ops: Support requests for information, measure effectiveness of I/O campaigns
Resource Management: Increase efficiency or develop risk mitigation strategies in resource allocation
Functional Offices or Task Force elements: Quantitative and qualitative analysis as required

5. Why utilize ORSA personnel?

ORSA personnel have a significant track record of uncovering new methods to exploit the enemy's patterns and weaknesses and reduce risk to friendly forces by examining our own patterns and behaviors.

Figure 1.4 Historical Examples.

World War II (1941) Royal Air Force Coastal Command ORSA's work on depth charge settings increased the efficiency (on a magnitude of 400 – 700%) of aerial attacks on German submarines[1]
World War II (1943) Analysis on Atlantic convoys showed the loss rate of merchant ships could be reduced by simply increasing the size of the convoys This also reduced the overall number of crossings by one-third and the number of U-boat attacks by almost as much[2]
Operation Iraqi Freedom (2004) Analysts were instrumental in shifting away from purely kinetic measures of effectiveness and toward quantifiable essential services / basic needs as a method to assess progress in a counterinsurgency

[1]Shrader, Charles R, History of Operations Research in the United States Army Vol I: 1942 – 1962, p 12. [2] Ibid, p13.

6. Summary.

ORSA analysts are both military and civilian personnel who perform quantitative and qualitative analysis throughout the decision-making process. ORSA personnel use several methods and tools to produce clear and concise analysis. They contribute in the operational environment by managing large quantities of data, developing strategies, developing metrics, and providing tactical, operational, and strategic recommendations to senior leaders and decision-makers.

CHAPTER II: CONTRIBUTION TO MILITARY DECISION-MAKING PROCESS

1. General.

ORSA personnel are actively involved in the MDMP and increase the effectiveness of this process by ensuring analytical rigor and continuity throughout mission planning, execution, and assessment.

ORSA personnel play a large role in the final assessment of the mission. To this end, ORSA personnel provide valuable insight and continuity in the early planning stages of the mission. ORSA personnel may help the staff link actions and tasks to appropriate and available forms of measurement. They ensure that necessary data is collected (collection plan) and identified for decision-makers. ORSA personnel also assist planners in developing the assessment metrics (e.g. effects, measures of effectiveness (MOEs), measures of performance (MOPs) and indicators).

This chapter provides examples and highlights areas in the MDMP where ORSA personnel may play a significant role.

2. Receipt of Mission.

ORSA personnel support the Commander and staff with updates to standing staff estimates and analytical products. In conjunction with the staff, ORSA personnel conduct quick initial assessments with an eye toward impacts on COA development and information requirements. ORSA personnel monitor, track and aggressively seek information important to the overall assessment of the mission.

3. Mission Analysis.

a. Mission Analysis. Collaboration between ORSA personnel and other analysts contributes to the success of the mission analysis. ORSA personnel commonly contribute to the tasks shown in bold font in Figure 2.1.

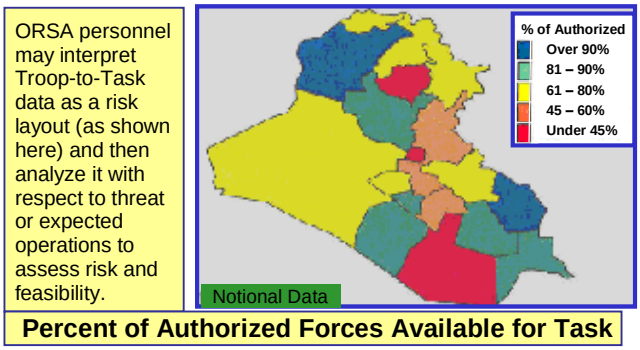
Figure 2.1 Mission Analysis Tasks.

Task 1: Analyze the higher HQ order
Task 2: Perform initial Intelligence Preparation of the Battlefield (IPB)
Task 3: Determine specified, implied, and essential tasks
Task 4: Review available assets
Task 5: Determine mission constraints
Task 6: Identify critical facts and assumptions
Task 7: Perform risk assessment
Task 8: Determine initial Commander's Critical Information Requirements (CCIRs) and Elements of Essential Friendly Information (EEFI)
Task 9: Determine the initial ISR plan
Task 10: Update operational timelines
Task 11: Write the restated mission
Task 12: Deliver a mission analysis briefing
Task 13: Approve the restated mission
Task 14: Develop the initial Commander's intent
Task 15: Issue the Initial Commander's Intent
Task 16: Issue a Warning Order
Task 17: Review facts and assumptions

b. Intelligence Preparation of the Battlefield (IPB). ORSA personnel contribute to this process by identifying critical vulnerabilities, capabilities, limitations, and intentions of the enemy. ORSA personnel evaluate and analyze existing databases to identify trends using historical or pattern analysis. Using geospatial tools, ORSA personnel help convey the nuances of cultural, topographical, economic, and other factors of the battlespace. This analysis is incorporated in their own, or other staff elements', Situational Template (SITTEMP).

c. Review Available Assets. ORSA personnel are well equipped to address the relationships between tasks and available assets. Analysis of force allocation, resource requirements, troop-to-task allocation, and similar constraints contributes to this process. Figure 2.2 gives an example of available assets for a given task.

Figure 2.2 Example of Available Assets.



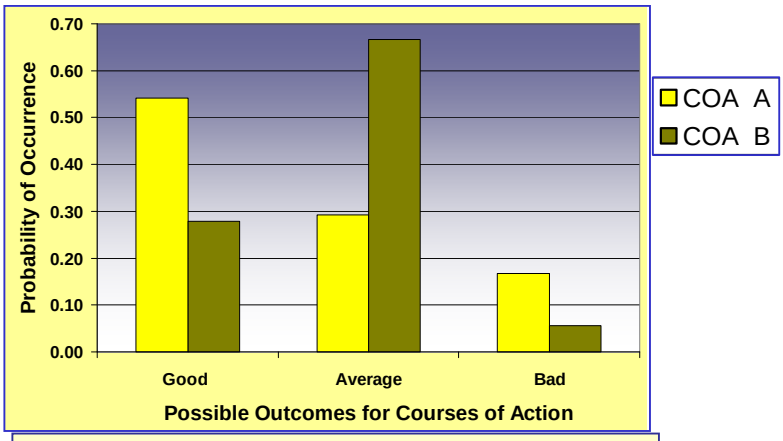
d. Identify Critical Facts and Assumptions. ORSA personnel measure the effect of resource and mission constraints to help identify hidden assumptions and critical facts that limit or constrain the COAs available to the Commander. ORSA personnel help identify necessary information to change assumptions into facts, clarify how to measure that information, and incorporate this into the collection plan. As noted in Figure 2.3, this process is ongoing throughout the planning process.

Figure 2.3 Facts and Assumptions.

Facts/Assumptions: Throughout the MDMP, ORSA personnel monitor / evaluate incoming information to validate facts and review assum ptions outlined in the mission—keeping the Commander informed of changes in facts or assumptions and associated impacts on planning or asses sing.

e. Risk Assessment. ORSA personnel identify, assess, and help manage risk by applying various techniques to quantify benefits and costs associated with various elements of the mission. ORSA personnel incorporate the risk analysis into risk mitigation strategies that help identify less desirable outcomes, their probabilities, and the appropriate action for risk mitigation as shown in Figure 2.4. ORSA personnel update risk assessments throughout the MDMP.

Figure 2.4 Example of Risk Assessment.



Here, it is more likely that COA A will result in a "Good" outcome than COA B. However, COA A also has a greater likelihood of resulting in a "Bad" outcome than COA B. Analysis like this helps keep the Commander informed of risks and their probabilities.

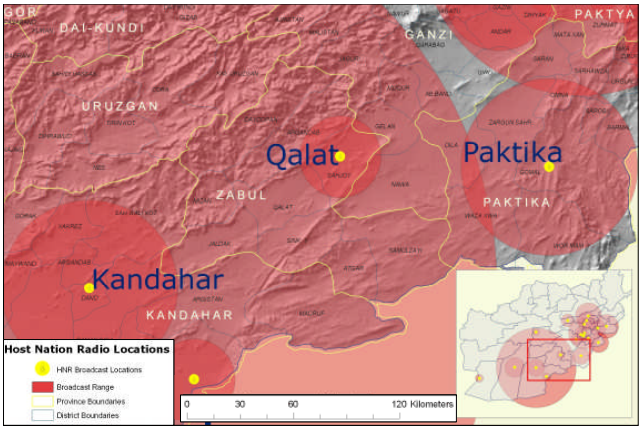
f. Initial Commander's Critical Information Requirements (CCIRs) and Elements of Essential Friendly Information (EEFI). Available data sources are often inadequate to properly analyze and assess the mission. As a result, ORSA personnel assist in the development of the data collection plan to remedy this information shortage (see Figure 2.5). Data obtained in the collection plan also assist in the assessment of the enemy's capabilities and may shed light on possible enemy courses of action.

Figure 2.5 Collection Plan.

Collection Plan: consists of priority intelligence requirements (PIR), requests for information (RFI), and collection requirements (CR). The collection plan is developed in conjunction with the metrics used to assess the mission and identifies the unit or agency responsible for providing or collecting the data. It is usually included as part of the assessment annex.

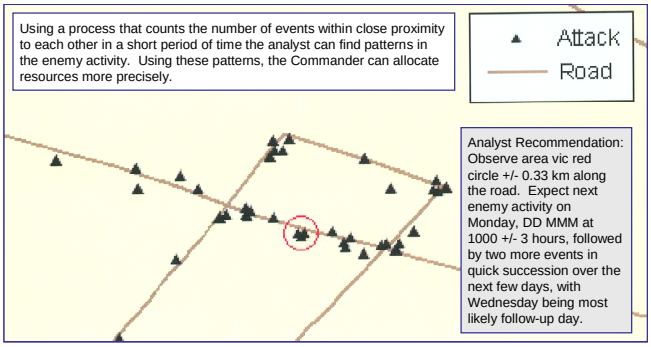
g. Initial Intelligence, Surveillance and Reconnaissance (ISR) Plan. The IPB and CCIR processes help identify information gaps addressed in the initial ISR plan. ORSA personnel are adept at modeling the best reallocation of ISR assets given the Commander's intent, availability of resources, information priorities, risks, and other factors. Figure 2.6 shows a geospatial depiction of overlapping radio towers. Where the red color darkens, overlap between two or more towers exists. Similar analysis could show coverage areas for quick reaction forces.

Figure 2.6 ISR Allocation Example.



h. Update Operational Timeline. ORSA personnel use flow modeling, or decision-point analysis, to help revise the initial operational timeline. ORSA personnel may compare friendly and enemy timelines to determine the most advantageous window of action or the most vulnerable time of action. Consider Figure 2.7, which shows a model that forecasts likely locations f enemy activity based on previous enemy actions.

Figure 2.7 Forecasting Enemy Activity.



i. Mission Analysis Briefing. ORSA personnel are adept at presenting information in a clear and concise manner. ORSA personnel excel in compiling large quantities of data, including facts and assumptions, and conveying it succinctly in crisp comprehensive images.

4. Development of Friendly Courses of Action.

a. The analysis and results of the IPB and mission analysis aid in the development of the friendly COA. ORSA personnel in the operational environment contribute to the development of COAs with an eye toward the information requirements needed for comparison and assessment.

Figure 2.8 ORSA Input into COA Development.

ORSA personnel are concerned whether the COA is:

Feasible: May use modeling to determine if the mission can be accomplished with the available time, space, and resources.
Acceptable: May model benefits and costs in executing the COA.
Suitable: May model the implications to the COA if changes in the commander's planning guidance occur.
Distinguishable: May quantify differences between COAs.
Complete: May model outcomes of the COAs and compare these to the measures of effectiveness and Commander's intent.

5. Analysis of Friendly COA (Wargaming).

ORSA personnel apply modeling techniques and contribute to the wargaming efforts during the analysis phase. Analytical contributions include:

a. Assist in the design and execution of wargames.

b. Supply quantified system performance data that drive war games.

c. Participate in wargaming.

d. Provide verification and validation of the wargame methods (when applicable).

e. Conduct analysis of the wargaming results using MOEs—derived from COA development—to provide insight into the proposed COA.

f. Conduct sensitivity analysis of ambiguous variables to capture risks of assumptions or COAs.

6. Comparison of Friendly COA.

ORSA personnel play a significant role in this process. Along with the staff, ORSA personnel:

a. Determine how to measure each COA's advantages and disadvantages and identify actions to overcome disadvantages.

b. Develop and prioritize a list of important governing factors and help determine appropriate weighting of factors, based on the Commander's guidance.

c. Determine the range of possible values for each governing factor.

d. Conduct final tests for feasibility, acceptability, and suitability.

7. Development of Plans/Orders.

a. Supervise plan. ORSA personnel provide meaningful contributions to this process by ensuring analysts at all levels of command understand the assessment metrics and collection plan. This requires coordination with analysts within higher- and lower-echelon commands and interagency elements. Analytical coordination between commands results in greater fidelity in the Commander's understanding of the environment, allowing for course corrections if needed, or to reinforce successes as they occur. Also, analytical coordination negates duplicative efforts and allows cross-echelon comparison of findings.

b. Review and Refine. Upon data collection, ORSA personnel are well trained to analyze and assess whether the desired effects were achieved. ORSA personnel and other staff elements provide follow-on recommendations to the Commander for action.

8. Summary of the Planning Phase.

ORSA personnel play a significant role in the planning and estimate-of-the-situation phases, further enabling informed decisions in the execution of operations. ORSA personnel, at all levels of command, serve best when integrated in the staff process, from the conception of the planning phase through the development phase. ORSA personnel bring a different skill set and perspective from the typical staff planner and provide added analytical rigor to the decision-making process.

CHAPTER III: ASSESSMENT PROCESS

1. General.

The assessment process is used to measure the progress toward accomplishing tasks, attaining effects, and achieving objectives outlined in a campaign plan. Assessments also aid in measuring the progress of specific action plans or tasks that are conducted in support of the Commander's intent. ORSA personnel play a large role in preparing and conducting the assessment process.

Figure 3.1 Assessments and MDMP

Assessments are used in the decision making process to:
- Adjust operations and resources as required.
- Determine when to execute branches and sequels of the plan.
- Make critical decisions to ensure current and future operations remained aligned with the desired end-state.
- Help identify potential mismatches between task and accomplishment and the achievement of higher-level effects and objectives.

2. ORSA Role.

During the mission analysis phase of the planning process, the ORSA cell will begin outlining potential assessment metrics. Measurable effects can result from both combat and non-combat actions with both lethal and non-lethal means. ORSA personnel use data from a variety of sources to measure these effects.

ORSA personnel help identify mismatches between intended effects and actual effects. Mismatches could result from resource shortfalls, inadequate progress in meeting required milestones, or misdirection of allocated resources or assigned tasks. The assessment identifies gaps between current and desired effects within the operational area. These considerations can affect the sequence of actions along lines of operations.

The assessment process does not conclude with simple analysis of what has occurred; rather, it includes analytically supported recommendations on how to build upon the current successes or correct for weaknesses in the previous mission(s). Campaign assessment is most often a stage of mission refinement.

3. Considerations.

a. Requirement for Extensive Collaboration. Effective assessment of tasks, effects and campaigns require that ORSA personnel regularly collaborate with staff elements within the command—vertically with higher or lower commands and horizontally across interagency and coalition partners.

(1) Consistency in Assessments. As with the development of plans, the assessment metrics need to be nested with those of the higher echelons of the command. A disconnect in metrics between the echelons of command causes the assessment phase to break down.

(2) Data Collection. The collection plan is developed in conjunction with the development of the assessment metrics. By incorporating the metrics of the next lower command echelon, inefficiencies may be reduced. The lower command echelon may already have a collection plan that can feed the assessment process. While developing the collection plan, the ORSA identifies data already collected by lower-command echelons and other agencies. This prevents duplicative data collection efforts and decreases the burden on responsible organizations. ORSA personnel help identify gaps in the collection plan, later tasked to specific organizations.

(3) Other Sources of Data and Assessments.

(a) Interagency. Interagency assessments often provide greater insight into the non-combat operations conducted in theater (e.g. USAID reconstruction projects, Department of State political activities and counter-drug activities.)

(b) Open-Source Documents. Surveys, projects or other open-source documents often provide data for the assessment process. These types of documents may serve as a way to verify military analysis and results.

(c) North Atlantic Treaty Organization (NATO), United Nations (UN) or Coalition Nations. Incorporating the assessments conducted by other nations provides greater fidelity to the assessment process. In OEF ORSA personnel at CFC-A worked with ORSA personnel of the ISAF throughout the assessment process. Often the host nation is a resource for the assessment process as well.

b. Location of Assessment Cell. It is recommended that ORSA personnel responsible for assessments are placed under the Chief of Staff.

(1) Commonly, working groups are formed to track the progress of subsequent orders issued by the Commander as a result of the assessment. The Chief of Staff chairs this working group, ensuring tasks are completed.

(2) Independent, unbiased assessments may be difficult to achieve when ORSA personnel within an assessment cell report to the planner or staff who develop the mission plan.

(3) The assessment process requires extensive coordination across the staff, vertical coordination with subordinate and higher units, as well as horizontal coordination with the interagency and host nation partners. Access to these staffs is advanced by working under the auspices of the Chief of Staff.

Location of the assessment cell or ORSA personnel responsible for assessing the mission within the Chief of Staff's office ensures independent and informed assessments.

4. Summary.

Effective assessments of tasks, effects and campaigns require analytical considerations during the phases of planning and execution of the mission. Transitioning from the planning phase to the assessment phase is smoother if coordination or staff overlap occurs between the two processes. The assessment cell will likely depend on numerous agencies for data and outside assessments.

CHAPTER IV: EMPLOYING ORSA PERSONNEL

1. Location.

Traditionally, information is housed in numerous agencies within and outside the theater of operations. The ORSA personnel's job is to collect, adjudicate, and summarize this disparate data for the Commander. To do this, ORSA personnel need access across the staff, to other commands and to interagency and Coalition staffs.

Solid working relationships, both horizontally and vertically, among the echelons contribute to the ORSA personnel's capacity for thorough analysis.

Both physical location and location within the staff hierarchy are considerations in locating ORSA personnel. Doctrinally, the ORSA is located under the Chief of Staff (XO in Brigades). This location enables cross-staff interaction.

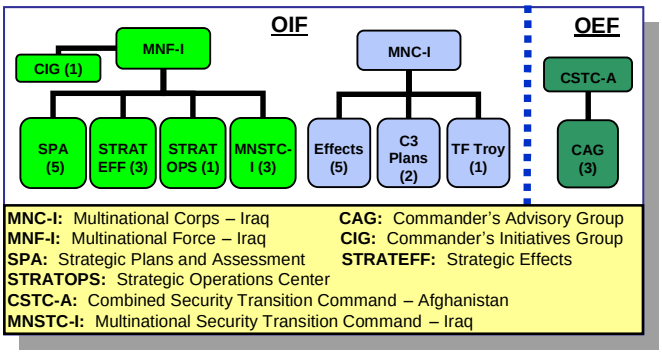
2. ORSA Operational Assignments.

The Army recognizes the added value of ORSA personnel on the staffs of senior Commanders. Doctrinally, ORSA personnel positions now exist at the Division through Army Service Component Command (ASCC) levels. Currently, two U.S. Army Majors complement a Division headquarters. The U.S. Army assigns three personnel - one Lieutenant Colonel and two Majors - at the Corps and ASCC levels. These manning levels should be achieved by 2011as the U.S. Army creates the authorizations for ORSA personnel within these operational commands. ORSA personnel are assigned to the Chief of Staff at Division, Corps, and ASCC echelons, which enables operations research support to the entire staff.

The U.S. Army is currently experimenting with the concept of assigning an ORSA to combat Brigade staffs. At the Brigade level, ORSA personnel are typically assigned to the Executive Officer (XO).

Figure 4.1 depicts the current structure and location of ORSA personnel deployed to OIF and OEF in Joint organizations. This allocation changes as the situation on the ground changes.

Figure 4.1 Current Locations in Major OIF / OEF Commands



a. Location: OIF.

(1) Multi-National Force – Iraq (MNF-I).

(a) Commander's Initiative Group (1).

(b) Strategic Plans and Assessment (5 Air Force/Army mix).

(c) Strategic Effects Assessment (3 Air Force/Army mix).

(d) Strategic Operations Center (1).

(e) Multi-National Security Transition Command – Iraq (3 ORSA positions).

(2) Multi-National Corps – Iraq (MNC-I).

(a) Effects Assessment Cell (3 Army, 2 - 4 Contracted).

(b) C5 Plans (2).

(3) Division. (2).

(4) Brigade. At the time of this publication, consideration was given to funding an additional deploying ORSA to each brigade.

(5) Task Forces. Analysts, both military and civilian, are located in functional assignments such as Task Force Troy and other ad hoc organizations. Additionally, numerous non-US analysts exist at all levels of command.

b. Location: OEF.

(1) Combined Security Transition Command – Afghanistan (CSTC-A), Commander's Assessment Group (CAG) (3).

(2) Division – Fire and Effects Cell (2).

(3) Analysts, both military and civilian, are located in functional assignments such as Task Force Paladin. Additionally, numerous non-US analysts support the International Security Assistant Force (ISAF).

3. Duties and Responsibilities.

The following paragraphs highlight common analytical duties and responsibilities of ORSA personnel:

a. Planning Process. Assist in the decision-making process with IPB, wargaming, COA analysis, monitoring, and assessing the execution of the plan. Chapter II reviews the ORSA impact on the MDMP.

b. Analysis. Conduct analysis to support Commander's decision-making processes. This may consist of answering requests for information (RFI) and conducting trend analysis of various attack or casualty data. Analysis often supports resource allocation, optimal flow analysis of new technology into theater, and battlespace transition analysis. Annex A provides more examples of common analysis.

c. Assessment. Identify, develop, and analyze metrics that quantify effectiveness of operations in support of the objectives and effects outlined in the campaign plan. This includes task assessment (Are we doing things right?), effects assessment (Are we doing the right things?) and campaign assessment (Are we accomplishing the mission?). Chapter III reviews the ORSA role in the assessment process.

d. General. Other staff officer duties as required.

4. ORSA Tools / Specialized Equipment.

ORSA personnel require specialized hardware and software to implement their analytic techniques. Usually, ORSA personnel receive training and basic equipping before deployment. Additional specialized software may be necessary in certain environments.

a. Readily Available Equipment. Most of the tools used by forward-deployed ORSA personnel are standard Army issue, currently a Microsoft suite of programs.

Figure 4.2 Microsoft Suite of Programs.

Microsoft Suite:
Excel ~ Access ~ PowerPoint ~ VISIO

b. Specialized software. The ORSA community is refining a standard computer software and hardware requirement for ORSA personnel. Until this standard is set, ORSA personnel will likely need access to the following additional types of software:

(1) Statistical package (e.g. SPSS, STATA, MiniTAB)

(2) Simulation Software (ProModel, Arena, MATLAB)

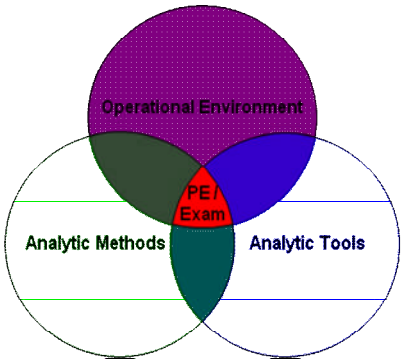
(3) Geospatial analytic capability. This may be in the form of laptop/desktop capable software (e.g. ArcGIS, GRASS, GeoServer), or as an add-on to other information management tools (e.g. Command Post of the Future, Falcon View). See Annex B for more information on geospatial analysis.

5. Pre-Deployment ORSA Training (ORSA Operational Training Course (OOTC), Army Logistics Management College (ALMC), Ft. Lee, VA).

A two-week program of instruction prepares ORSA personnel for service on a Deployed Analyst Support Team (DAST) embedded within a Brigade-or-above Headquarters staff. The OOTC complements current ORSA Military Applications Course (ORSAMAC) and/or Advanced Civilian Studies, Intermediate Level Education (ILE) and FA49 Qualification-Course (Q-Course) training.

a. Curriculum. Topics in the OOTC include strategic environment, historical analysis, knowledge management, along with refresher training on statistical, decision modeling, and geospatial software applications. Together, these provide an opportunity for ORSA personnel to use the most current contextual, conceptual, and technical skills in solving problems they may face while serving on a Command staff. These topics are grouped as shown in Figure 4.3.

Figure 4.3 OOTC Topics.



b. Application. This pre-deployment training augments the ORSA personnel's technical and operational training with the most recent theater-specific lessons learned.

(1) The Operational Environment. This facet of training gives contextual understanding through a strategic and operational orientation to current military efforts. It includes a review of current staff battle rhythms and historic military operations research. Current or recent campaign plans are a key element of this section. ORSA personnel are exposed to both historic and current analytic efforts.

(2) Analytic Methods. This section provides a refresher on conceptual techniques for solving complex problems. Problem formulation methods, data and knowledge management topics, techniques of analyzing data, best practices for representing data, probability and statistics methods, survey analysis techniques, and development of resource allocation schemes are a few of the conceptual methods ORSA personnel review.

(3) Analytic Tools. This section of ORSA training ensures proficiency in the most current Microsoft tools such as Excel and Access, along with data manipulation techniques. Add-in software for Excel that enables decision-making analysis, advanced statistical analysis, and other techniques is included. Introduction to geospatial software (FalconView, ArcGIS) is provided as a method of temporal and spatial data analysis. Annex B discusses the capability of geospatial modeling in more detail.

(4) Practical Exercises. This provides ORSA personnel an opportunity to integrate contextual, conceptual, and technical skills in solving problems often faced by deployed personnel. Exercises reflect recent analyses conducted during ongoing operations.

6. Summary.

This chapter highlights employment considerations for ORSA personnel. ORSA personnel, typically under the Chief of Staff, are located such that horizontal and vertical coordination can occur. Prior to deploying, ORSA personnel receive refresher training on skills and needed software, as well as receiving a theater-specific contextual review.

ANNEX A: EXAMPLES OF ANALYSIS

1. General.

This annex shows examples of types of analysis that ORSA personnel perform in the operational environment. This annex does not contain the typical bar graphs and pie charts common in briefings; rather it strives to highlight additional areas in which ORSA personnel provide support.

2. How to Use this Annex.

The following examples begin with common questions that a senior operational Commander is likely to ask. Possible types of analysis to answer this question follow, along with the kind of answers a Commander can expect from this type of analysis.

a. Measuring Effects in Time and Distance.

(1) Commander's Question: Is this friendly activity (cordon and search, raid, road block, etc.) reducing enemy activity?

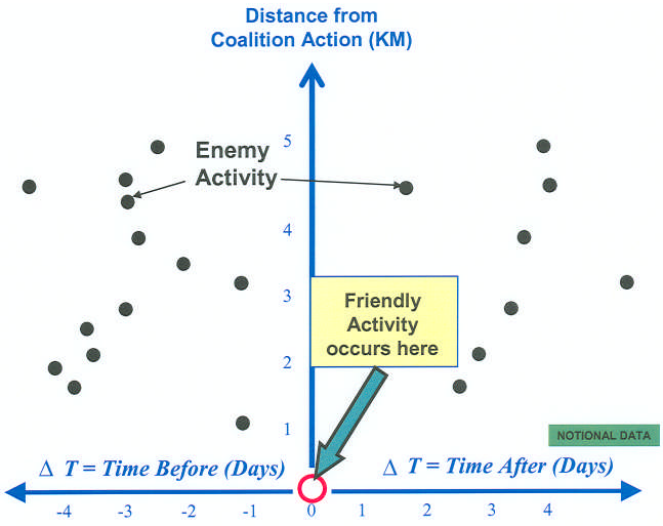
(2) Method: Compare the number of enemy events, before and after a friendly activity, to see if there is a significant difference.

(3) What the Analyst Does: A statistical procedure that looks at each occurrence of a particular friendly activity and counts the number of enemy events that occurred before and after within an established area.

(4) Possible Answers: From a large enough sample of friendly activities, the analyst can determine whether or not the enemy activity decreased, stayed the same, or increased. The ORSA can also determine how long this change in enemy activity is expected, i.e. days or weeks. See Figure A.1 below.

Figure A.1 Effects over Time and Space.

The friendly activity indicated here could be "militia disarmed" or "curfew emplaced" or "presence patrol", as long as a database exists from which to draw these friendly and enemy events.



Results indicate not only how effective friendly activity is at reducing enemy activity, but also the distance in space and time that it remains effective.

b. Regional Analysis with Maps.

(1) Commander's Question:

(a) How has the threat migrated over time across areas (region, province, neighborhood)?

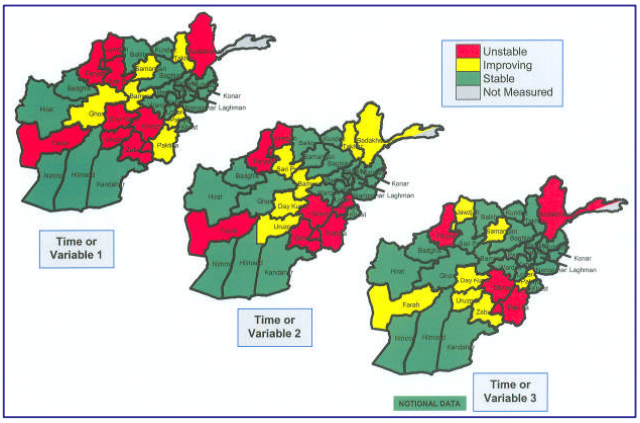
(b) How does this province compare to its neighbors on Variable 1, 2, or 3?

(2) Examples. Pictorially show relationships using common color coding schemes.

(a) Changes over Time. In Figure A.2 below, Afghanistan, by province is shown over three time periods. The coloring of each province indicates how it measured on a variable (perhaps overall security). By displaying three time periods, the analyst depicts change over location and time.

(b) Changes across Variables. This method could be used instead to show how provinces fare on three separate variables (time is kept constant). For example, the first image (upper left) could depict how secure each province is (Variable 1), the second image could measure economics (Variable 2), and the third governance (Variable 3).

Figure A.2 Change Over Time or Change Across Variables.



c. Survey Analysis.

(1) Commander's Question:

(a) How do these seven areas compare on ethnicity composition and religion?

(b) What were the breakout of the rank and branch of the soldiers who responded to this survey?

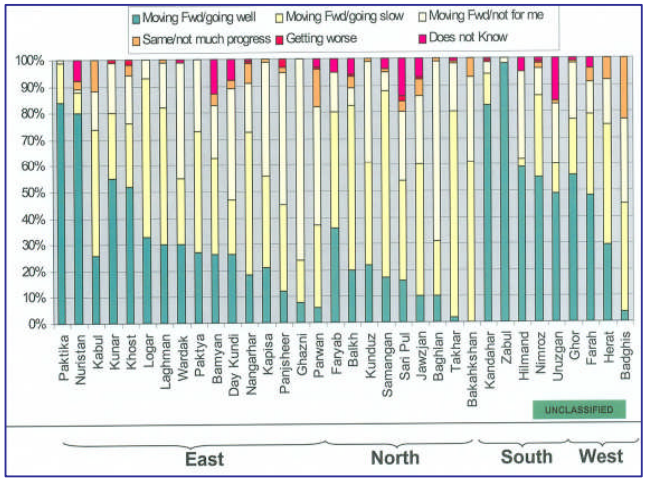
(c) Show the breakout of this variable for any two (or more) other variables.

(2) Method: As the groups being examined may be of different sizes, a cumulative percent graph displays relationships better than an average bar chart.

(3) Example: See Figure A.3.

Figure A.3 Survey Trends in Afghanistan.

In this example, the number of respondents surveyed differs for each province. This method captures provincial and regional trends, while displaying the percentage of responses for a question on reconstruction efforts.



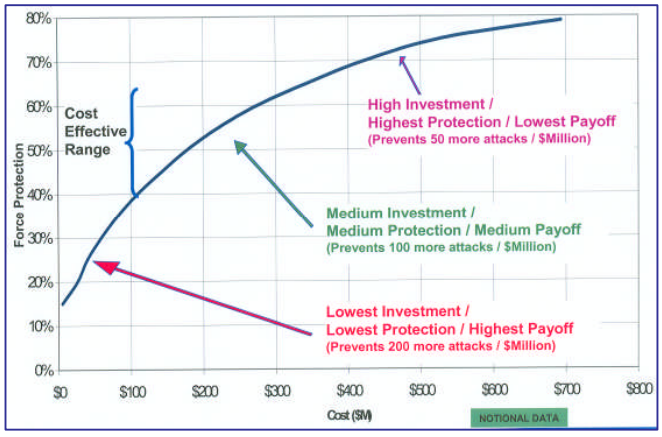
d. Resource Analysis.

(1) Commander's Question: What is the trade-off in added force protection for increasing or decreasing the number of units of resource "X" that I use (or procure)?

(2) Method: Graphical depiction of increased protection on Y axis and increased cost on X axis.

(3) Possible Answers: For each unit that is used, force protection increases by X amount, or for each unit of protection past X number of units, very little added protection is gained. See Figure A.4 below for example.

Figure A.4 Risk Analysis in Acquisition.



In this example, as spending on Force Protection "X" increases, the payoff (# of attacks thwarted / $1m) decreases. Analysis such as this helps the Commander in his definition of acceptable risk.

e. Buffer Analysis.

(1) Commander's Question:

(a) How many enemy attacks have occurred within five kilometers of this place?

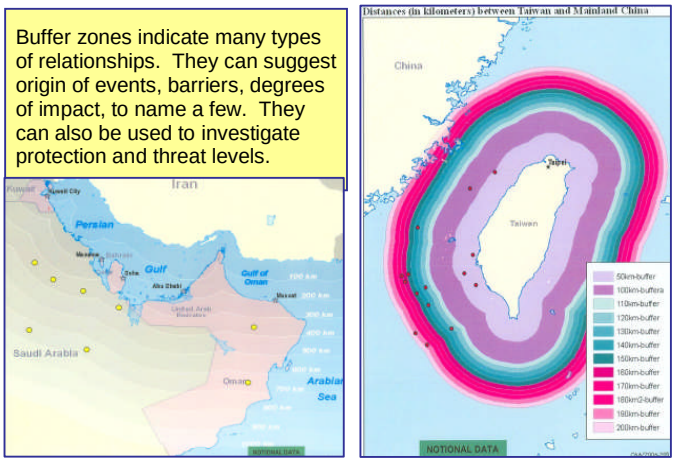
(b) How far can this sensor reach if we upgrade it to Option A? Option B? Option C?

(c) How many small arms attacks occurred within 10, 15, or 20 kilometers of this suspected enemy location?

(2) Method: Depict buffer zones around a geospatial site to determine the number of events that occurred within (or outside of) the area of interest.

(3) What the Analyst Does: Utilizes geospatial software to display area of interest, buffer zone(s) of desired distance, and plot events of interest. See Figure A.5 on the following page.

Figure A.5 Buffer Rings.



f. Risk Analysis.

(1) Commander's Question:

(a) What are the costs of moving this resource from point A to point B?

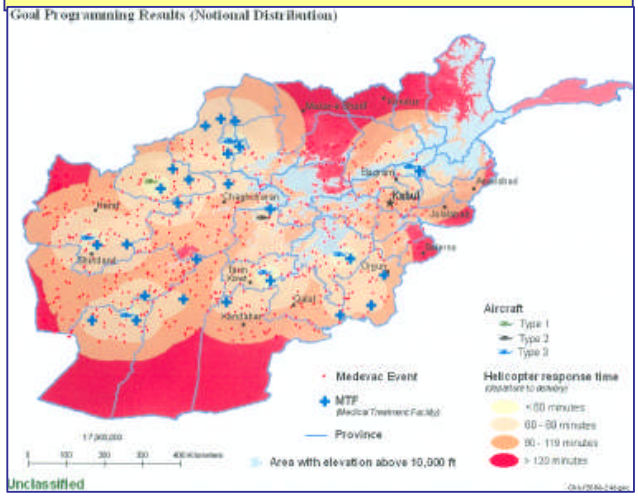
(b) What are the risks in adding or subtracting units of resource "X"?

(2) Method: Identify three or more possible COAs for the resource allocation and compare risks by mapping historical events to determine whether they fall within (or outside of) buffers (or effectiveness areas) for each unit of resource.

(3) Possible Answers: Displays areas that would not be covered (outside of buffer) by the asset or areas that are fully saturated in coverage and can afford fewer assets. Consider Figure A.6 below.

Figure A.6 Medical Evacuation Buffer Analysis.

In this example, distances that can be aerially covered from a medical treatment facility are shown. This highlights a method of analyzing risk.



g. Pattern Analysis.

(1) Commander's Question:

(a) Is this the same enemy cell that attacked this area before?

(b) Have we found any patterns to the enemy's behavior?

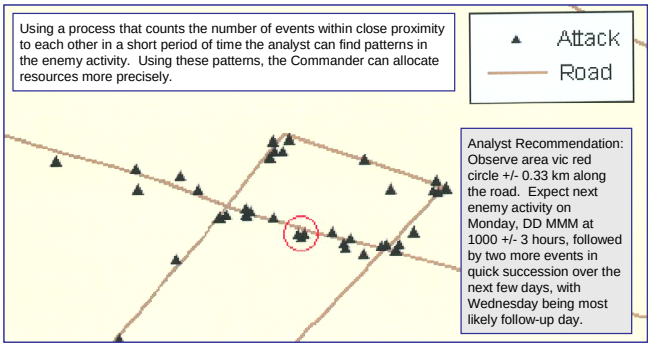
(c) Can we predict with some certainty the next time the enemy will act?

(2) Method: Using criminal pattern analysis used by the Federal Bureau of Investigation (FBI) and predatory pattern analysis used by wildlife experts, predict the enemy's future actions based on the enemy's previous actions.

(3) What the Analyst Does: Utilizes geospatial software and statistical techniques to determine likely cells of activity, expose patterns, and predict enemy behavior.

(4) Example: Figure A.7 below is an algorithm example created at the Center for Army Analysis and adapted by the U.S. Marine Corps in Iraq at the Division level.

Figure A.7 Forecasting Enemy Activity.



ANNEX B: GEOSPATIAL MODELING

1. General.

The purpose of this Annex is to provide a brief overview of the capabilities inherent in geospatial modeling and to demonstrate how this technique may be employed in the decision-making process.

2. Definition.

Geospatial modeling utilizes a visual representation of the physical world to produce maps, perform interactive queries, or perform analysis.

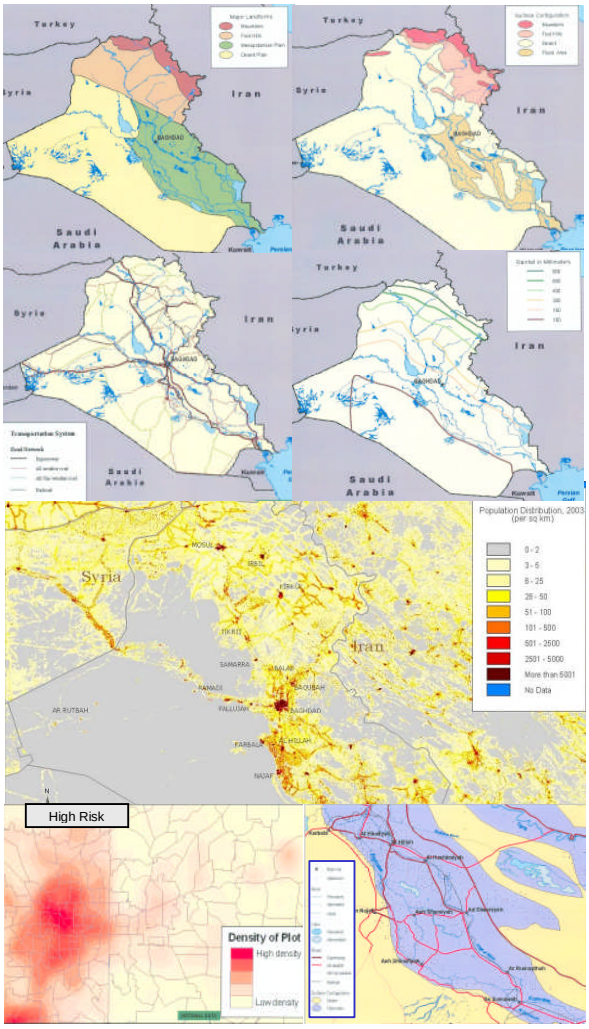
3. Military Decision-Making Process.

Geospatial modeling and analysis is useful throughout the planning process, from the IPB to COA comparisons. The added benefit of using this type of resource in the decision-making process is that it can combine and relate information from several sources into a single map. Geospatial modeling enables visualization of the battlespace and brings complex relationships between features within the battlespace to the forefront. Specifically, geospatial modeling may contribute to the planning process in the following ways:

a. Visually define the operational environment.

b. Visually describe the operational environment, including a modified combined obstacle overlay, while incorporating elements traditionally outside the military sphere of influence. See Figure B.1 on the following page.

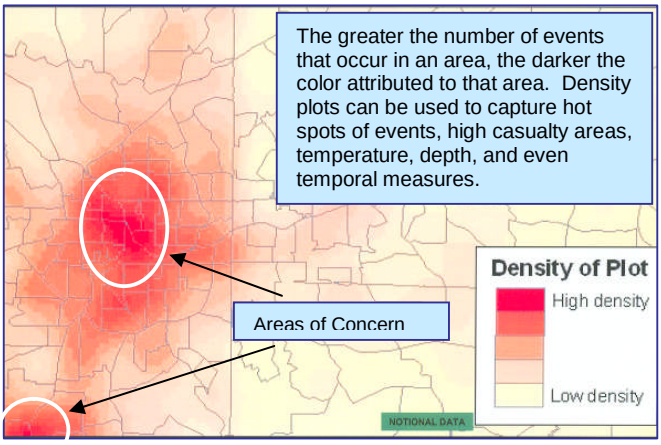
Figure B.1 Terrain and Population Analysis.



c. In the mission analysis phase, geospatial modeling enables planners to visualize problem areas and high-risk time periods and then determine tasks needed to achieve the desired effects.

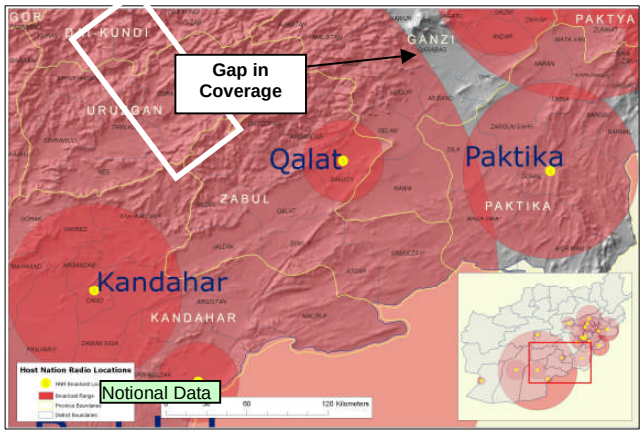
For example, geospatial modeling may help identify time periods of low enemy activity or locations of suspected weapons caches. See Figure B.2 below.

Figure B.2 Density Plot.



d. Geospatial modeling contributes to the Commander's understanding of geospatial and temporal concerns when comparing competing COAs. This often contributes to the Decision Support Template. Specifically, geospatial modeling may identify geographic decision-points, weak lines of communication, force flow priorities, quick-reaction-time limitations, aerial asset coverage/limitations, and more. See Figure B.3 below.

Figure B.3 Radio Coverage over Areas of Operation.



e. Identify gaps in available information and define the information needed to assess the effects of the operation.

4. Assessment Process.

Geospatial modeling can contribute to the assessment of tasks, measures of effects and campaigns by:

a. Illuminating areas that show success and areas that may need more attention.

b. Visualizing the operational environment beyond the traditional military battlespace as an interconnected system-of-systems comprised of friends, adversaries, and the unaligned.

c. Harmonizing and synchronizing military actions with the actions of other instruments of power.

d. Displaying strategic and operational effects—outcomes separated in space and time from their causative actions—whether desired or undesired.

e. Assessing system behaviors and capabilities of the enemy, civilians, or the media.

f. Incorporating information from multiple sources, including interagency or combined data sources and open- source information to show the effects of the operation.

5. Summary.

This Annex provided a brief overview of GIS capability employed by deployed ORSA personnel with respect to MDMP and the assessment process.

ANNEX C: REACH-BACK CAPABILITIES

1. Who Provides Reach-back Analytical Support?

Typically, Army analytical agencies and a select few contracting agencies, within the continental United States (CONUS) provide support in a surge or augmentation capacity as needed by the operational command. Sometimes this capacity is provided from the Combatant Command to major units within its theater of operations.

2. What is Reach-back Analytical Support?

Reach-back analysis allows forward-deployed or operational ORSA personnel serving at Brigade, Division, Corps, Army Service Component Command (ASCC), and Multi-National Command headquarters to draw upon both the resources and capabilities of CONUS analytical organizations/institutions. Reach-back analysis augments the operational ORSA capability. Typically, the forward-deployed ORSA personnel are self-sufficient for the analytic needs of the Command. Occasionally, ORSA personnel will seek greater resources from CONUS to augment their analysis in theater when the complexity and/or scope of a given problem exceed their organic capability. Army analytical organizations possess a wide array of expertise and analytical tools.

ORSA topics span Doctrine, Organizations, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF). Examples of reach-back support include development of campaign plan assessment methods, convoy protection analysis, sensor placement recommendations, basing analysis, medical asset allocation recommendations, new materiel fielding and utilization analysis, Intelligence Preparation of the Battlefield (IPB) assistance, attack pattern analysis, economic forecasting, force structure/size recommendations, and more. Below are several topics for which Commanders commonly seek analytical support from CONUS organizations through reach-back.

a. Campaign Plan Assessment. Commanders may utilize reach-back support in assessing campaign plans and developing MOEs and MOPs. (See Chapter III for more information on ORSA support to the assessment process.) For example, CFC-A utilized CONUS ORSA personnel and software in MOE assessments via reach-back support.

b. Casualty Analysis. This may include efficacy of personal equipment and implications for operating force Tactics, Techniques and Procedures (TTP). CONUS conducted reach-back analysis in support of both OIF and OEF on emergency medical facility and evacuation coverage.

c. Theater Campaign Modeling and Analysis. Theater campaign modeling focuses on joint and combined operational or strategic environments. These models incorporate weapon effectiveness data, unit formations, current war plans, and other factors in support of campaign analysis. Air and missile defense along with weapons of mass destruction (chemical, biological, radiological and nuclear) are analyzed at the tactical, operational, and strategic level. Additionally, with numerous new ISR systems active in operational theaters, reach-back analysis often supports the Commanders' allocation and location decisions.

d. Force-on-Force Modeling and Simulation. CONUS ORSA personnel develop and maintain a class of warfighting force-on-force Models and Simulations (M&S), ranging from individual objects (e.g., soldier, weapon, terrain feature) to theater-level models that often aggregate objects (e.g., battalions) at Corps level. The Army Materiel Systems Analysis Agency (AMSAA) leads Army efforts in modeling platform performance parameters. Training and Doctrine Command (TRADOC) Analysis Center (TRAC) focuses on Corps and below force-on-force combat models, while the Center for Army Analysis (CAA) conducts theater-level campaign analysis. Collectively, these models are widely used in support of current operations.

e. Weapon Systems Analysis. Weapon systems analysis enables an understanding of the system, its functions, performance, effectiveness measures, operational criteria and associated costs. The ORSA community provides comprehensive assessment of the impact of friendly or enemy weapon systems on the operational environment. The Army Test and Evaluation (ATEC) Command and AMSAA lead this type of analytical support.

3. Why Reach-back?

Reaching back to CONUS organizations allows a command to augment its own resources. The following is a non-exhaustive list of factors motivating the use of analytic reach-back:

a. Subject Matter Expertise. CONUS organizations possess a wide diversity of expertise. Reach-back provides a mechanism for tapping into experts with specialties not found in theater for especially difficult or nuanced problems.

b. Manpower. Some projects or problems require more manpower than can be spared in an operational environment. Reach-back allows deployed ORSA personnel an opportunity to tap resources beyond their organic capabilities.

c. Analytic Review Process. Reach-back provides a natural review process for analytic efforts. Due to the collaborative aspect of reach-back, multiple personnel review reach-back analytic products. While this requires more time, it ensures high quality products.

d. Analytic Tools. Reach-back provides the deployed analyst access to sophisticated tools and high-powered models. CONUS institutions have the computing power that is often missing in operational environments.

e. Required Surge Capability. CONUS organizations also send ORSA personnel to an operational environment to supplement the command's current ORSA contingent. For example, the Center for Army Analysis (CAA) has provided Deployed Analyst Support Teams (DAST) to theater during major exercises and theater commands from the start of both OIF and OEF.

4. Where Do I Reach-back for Support?

These CONUS organizations offer reach-back support:

a. Center for Army Analysis (CAA) (http://www.caa.army.mil COM (703) 806-5527/5680 DSN 656, Ft. Belvoir, VA)

The mission of CAA is to conduct analyses of Army forces and systems in the context of joint and combined warfighting. CAA analyzes strategic concepts and military options along with estimating requirements to support Army inputs to the Planning, Programming, Budgeting, and Execution process (PPBEP). CAA evaluates the Army's ability to mobilize and deploy forces, Army force capabilities, force alternatives, developing theater force level scenarios, and conducting resource analysis.

b. Training and Doctrine Command (TRADOC) Analysis Center (TRAC) (http://www.trac.army.mil/ COM (913) 684-5132. DSN 552, Ft. Leavenworth, KS)

TRAC leads TRADOC's major studies of new warfighting Operations and Organization (O&O) concepts and requirements. TRAC also leads the Army's analysis of Advanced Warfighting Experiments (AWEs), and the Army's Analysis of Alternatives (AoA). Topics span doctrine, training, operations, leader development, organization, materiel, and soldier support. TRAC develops and maintains a class of warfighting Modeling and Simulations (M&S) referred to as force-on-force, ranging from individual objects (e.g., soldier, weapon, terrain feature) to aggregated objects (e.g., battalions) at Corps level. TRAC also develops scenarios of potential military operations set in the future for use in modeling and analysis. TRAC also maintains expertise in measuring the human dimension, developing surveys, interview techniques, content analysis of survey/interview data, and cost analysis.

c. Army Materiel Systems Analysis Agency (AMSAA) (http://www.amsaa.army.mil/ COM 410-278-6614. DSN 298, Aberdeen Proving Ground, MD)

AMSAA conducts responsive and effective materiel and logistics systems analyses to support decision-making for equipping and sustaining the U.S. Army. AMSAA provides item-level performance data and analyses for a

variety of military systems and subsystems to include target acquisition, weapon/personnel survivability, mobility/automotive performance, supportability, sensing, reliability, communication, and networks in support of current and future operations. AMSAA is committed to giving the Soldier decisive capability to win across the spectrum of future military operations, providing analytical expertise to help guide Army in selecting, acquiring, fielding and sustaining new technologies, and developing the analytical workforce of the future.

d. Army Test and Evaluation Command (ATEC) (http://www.atec.army.mil, Alexandria, VA)

ATEC plans, conducts, and integrates developmental testing, independent operational testing, independent evaluations, assessments, and experiments to provide essential information to Soldiers and into the hands of acquisition decision-makers supporting the American Warfighter.

e. Army Logistics Management College (ALMC) Systems Engineering Department (SED) – (http://www.almc.army.mil/sed/ COM (804)765-4633 / 4630 / 4226. DSN 539, Ft. Lee, VA)

f. Non-ORSA CONUS Organizations.

(1) National Ground Intelligence Center (NGIC). http://avenue.org/ngic/. NGIC's mission is to produce all-source integrated intelligence on foreign ground forces and support combat technologies to ensure that U.S. forces and other decision-makers will have a decisive edge on any battlefield.

(2) Joint Improvised Explosive Device Defeat Organization (JIEDDO). JIEDDO focuses (leads, advocates, coordinates) all Department of Defense actions in support of the Combatant Commanders and their respective Joint Task Forces' efforts to defeat Improvised Explosive Devices as weapons of strategic influence.

5. How Do I Reach-back to CONUS Analytical Organizations?

a. General. Currently, each ORSA CONUS organization manages its respective reach-back mechanisms independently. For example, the Center for Army Analysis (CAA) conducts an informal biweekly interagency meeting in an effort to coordinate reach-back efforts. While there is an effort to consolidate and formalize reach-back contributions from CONUS organizations, this chapter will only highlight the general reach-back process.

b. Formulating Reach-back Problems. In general, CONUS organizations will adapt to the requirements of deployed ORSA personnel, especially in terms of the timeliness of derived products. To aid CONUS organization endeavors, reach-back requests include the following information in as much detail as possible:

(1) Problem statement and background. Provide a clear definition of the problem along with essential elements of analysis. Specify the issues surrounding the analysis.

(2) Data. Provide data, if available, or recommendations on how to generate/obtain the data necessary for the analysis.

(3) Timelines. Specify desired completion time.

(4) Communication. Establish a method or protocol for communication and coordination.

(5) Releasability. Specify how and when analytic products may be released. Customer confidentiality must be maintained; however, information sharing improves understanding within the ORSA community.

6. Other Considerations.

a. Timeliness. Deployed Operational Army or Joint Headquarters generally operate 7 days per week with 12-14 hour workdays. Analytic requirements from these headquarters often have short deadlines. The value of the reach-back support must be weighed against time to do proper analysis.

b. Confidentiality of Derived Analysis. CONUS organizations are customer focused. In this case, these organizations must obtain Operational Army Command release authority before disseminating derived analytic products. This release authority ensures customer confidentiality in analytic products that often concern contentious issues.

7. Summary of Reach-back.

CONUS organizations can augment the operational command's organic capability of ORSA personnel with resources, analysis, or personnel as needed.

ANNEX D: GLOSSARY

ALMC - Army Logistics Management College
AMSAA - Army Material Systems Analysis Activity
ANA - Afghan National Army
AOA - Analysis of Alternatives
AOR - Area of Operations
ASCC - Army Service Component Command
ATEC - Army Test and Evaluation Command
AWE - Advanced Warfighting Experiments
BDA - Battle Damage Assessment
BUA - Battle Update Assessment
CAA - Center for Army Analysis
CAG - Commander's Advisory Group
CCIR - Commander's Critical Information Requirements
CERP - Commander's Emergency Response Program
CES - Commander's Estimate of Situation
CFC-A - Combined Forces Command Afghanistan
CIA - Central Intelligence Agency
CIED - Counter Improvised Explosive Device
CIG - Commander's Initiative Group
CIO - Chief Information Officer
COA - Courses of Action
CONOP - Concept of the Operation
CONUS - Continental United States
CR - Collection Requirements
CSTC-A - Combined Security Transition Command – Afghanistan
DA PAM - Department of Army Pamphlet
DAST - Deployed Analyst Support Team
DIA - Defense Intelligence Agency
DOD - Department of Defense
DOTMLPF - Doctrine, Organizations, Training, Materiel, Leadership, Personnel, and Facilities
DSN - Defense Satellite Network
DTIC - Defense Technical Information Center
EAC - Effects Assessment Cell
EEA - Essential Elements of Analysis
EEFI - Essential Elements of Friendly Information
EWG - Effects Working Group
FA - Functional Area
FBI - Federal Bureau of Investigation
FM - Field Manual
FOB - Forward Operating Base
FWD - Forward
GIS - Geographic Information System
IED - Improvised Explosive Device
ILE - Intermediate Level Education
IPB - Intelligence Preparation of the Battlespace
ISAF - International Security Assistance Force
ISR - Intelligence, Surveillance, and Reconnaissance
IWS - Information Work Space
JFC - Joint Forces Command
JIATF - Joint Interagency Task Force
JICM - Joint Integrated Computer Model
JIEDDO - Joint Improvised Explosive Device Defeat Organization
JIPB - Joint Intelligence Preparation of the Battlespace
JSOC - Joint Special Operations Command

JTF - Joint Task Force
LOO - Line of Operation
M&S - Model and Simulation
MDMP - Military Decision Making Process
MEDEVAC - Medical Evacuation
MNC-I - Multi-National Corps Iraq
MNF-I - Multi-National Forces Iraq
MNSTC-I - Multi-National Security Transition Command
MOE - Measure of Effectiveness
MOP - Measure of Performance
MTF - Medical Treatment Facilities
NGIC - National Ground Intelligence Center
NGO - Non-Governmental Organization
O&O - Operations and Organizations
OEF - Operation Enduring Freedom
OIF - Operation Iraqi Freedom
OOTC - ORSA Operational Training Course
ORSA - Operational Research/System Analysis
ORSAMAC - ORSA Military Applications Course
PC - Personal Computer
PE - Practical Exercise
PEL - Priority Effects List
PIR - Priority Intelligence Requirement
POI - Program of Instruction
PPBEP - Planning, Programming, Budgeting, and Execution Process
Q-Course - Qualifications Course
RFI - Request for Information
SED - Systems Engineering Department
SITTEMP - Situational Template
SPA - Strategy, Plans and Assessment
SPSS - Statistical Package for the Social Sciences
TF - Task Force
TRAC - TRADOC Analysis Center
TRADOC - Training and Doctrine Command
TTP - Tactics, Techniques and Procedures
VTC - Video Telephone Conference
WEBTAS - Web-Enabled Temporal Analysis System
WSMR - White Sands Missile Range
XO - Executive Officer